

Applicant filed no such communication. Clarification is respectfully requested

I. Disposition of the Claims

Claims 1-20 are pending in the present application. Claim 3 has been amended.

II. Claim Amendments

Claim 3 has been amended to correct a typographical error.

III. Rejections Under 35 U.S.C. § 112

The Examiner rejected claim 3 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, the Examiner stated that the ratio range of 1 : 2 to 1 : 10 recited in claim 3 of ion concentration in “permeated water supplied to the final stage” to that in “permeated water not supplied to the final stage” was unsupported because the Specification discloses that the ion concentration in the permeated water “supplied” to be greater than that of the permeated water “not supplied.” Applicant thanks the Examiner for carefully reviewing the claims, and, in response, Applicant has amended the previously mistyped recited ratio range in claim 3 to “2 : 1 to 10 : 1.” Accordingly, claim 3 as amended is supported and withdrawal of the rejection is respectfully requested.

IV. Rejections Under 35 U.S.C. § 102

The Examiner rejected claims 1, 4, and 5 under 35 U.S.C. § 102(b) as being anticipated by Tonelli (U.S. Pat. No. 5,997,745). For the reasons set forth below, the rejection is

respectfully traversed.

The present application is directed toward a water treatment apparatus, with reference to Figure 1 and according to claim 1 of the present application, requires a plurality of composite reverse osmosis membrane modules 5 and 11 arranged in multi-stages, where each of the plurality of modules 5 and 11 includes a porous support and a polyamide skin layer formed on the porous support, where the plurality of modules 5 and 11 include a final-stage module 11 and at least one pre-final module 5, where a selected portion 7 and 10 of permeated water obtained from the at least one pre-final module 5 is supplied to the final-stage module 11, and where the rest 6 of the permeated water is discharged from or recovered in the water treatment apparatus along with the permeated water 12 obtained from the final-stage module 11. Advantageously, the present invention provides a low cost method of producing drinking water.

Tonelli, in contrast to the present invention, is directed to a method for producing high purity water. In Figure 1 of Tonelli, feedwater enters a high pressure side 8 of a first reverse osmosis unit 10 and then permeated water from a low pressure side 12 of the first reverse osmosis unit 10 is transferred to a high pressure side 16 of a second reverse osmosis unit 18. Permeated water from a low pressure side 22 of the second reverse osmosis unit 18 is then transferred to a high pressure side 26 of a third reverse osmosis unit 28, which, in turn, releases high purity permeated water from a low pressure side 38. Tonelli, col. 3, line 54 – col. 4, line 25. With regard to the requirements of claim 1 of the present application, Tonelli fails to disclose mixing of a portion of discharged permeated water from a pre-final reverse osmosis unit with discharged permeated water from a final reverse osmosis unit. Instead, Tonelli discloses the serial propagation of permeated water through multiple reverse osmosis units, by which no portion of discharged permeated water from a pre-final reverse osmosis unit, e.g., reverse

osmosis units **10** and **18**, is mixed with discharged permeated water from a final reverse osmosis unit, e.g., reverse osmosis unit **28**.

Moreover, as stated, the object of Tonelli is to improve the purity of final product water. To this end, Tonelli discloses passing feedwater through reverse osmosis membranes and does not disclose or suggest mixing a portion of permeated water from a pre-final reverse osmosis unit with permeated water from a final reverse osmosis unit as is required by the claims of the present application. In Tonelli, if a portion of the permeated water from a pre-final reverse osmosis unit is mixed with permeated water from the final reverse osmosis unit, the goal of obtaining high purity water cannot be achieved.

Furthermore, the disclosure of Tonelli altogether fails to disclose a method for converting seawater to freshwater. In other words, in order to obtain high purity water in Tonelli, the concentration of solute in the raw, i.e., unprocessed, water cannot be very high. For example, when raw water is treated with a reverse osmosis membrane having a 99% solute rejection rate and a 50% recovery rate, the solute concentration of the permeated water is decreased to 1.4% of the solute concentration of the raw water. Thus, when multiple reverse osmosis units as shown in Figure 1 of Tonelli are used, the solute concentration of the final product water would be about 0.02% ($1.4\% * 1.4\% = 0.0196\%$). Accordingly, it can be derived from an inverse operation that, in order to obtain a high purity final product water (10 to 18 MΩ cm), raw water to be treated needs to have an electrical conductivity of 280 to 500 μs/cm. In fact, raw water of 450 μs/cm is treated in Example 1 of Tonelli. Those of ordinary skill in the art will note that there is a close correlation between an electrical conductivity and a concentration of a solute contained in raw water. In the case where the solute is NaCl, raw water having an electrical conductivity of 280 to 500 μs/cm contains 140 to 250 ppm of NaCl. Raw water with

such a NaCl concentration is, for example, well water or drinking water. In contrast, in the present invention, raw water having 1% or more of solute can be treated. That is, according to the present invention, the concentration of solute in raw water that is to be treated may be 50 times or more than that of raw water usable in Tonelli, and hence, the present invention can be used to convert seawater ($>>1\%$ solute concentration) to freshwater whereas Tonelli cannot be used for such a purpose.

As discussed above, Tonelli fails to implicitly or explicitly disclose each and every limitation of claim 1 of the present application. Accordingly, withdrawal of the rejection is respectfully requested. Claims 4 and 5, which directly or indirectly depend from claim 1, are patentable for at least the same reasons.

V. Rejections Under 35 U.S.C. § 103

The Examiner rejected claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Tonelli in view of Masaaki (Japanese Pat. No. 10-305216). This rejection is respectfully traversed.

Claim 2 depends from claim 1, and as mentioned above, Tonelli fails to disclose each and every limitation of claim 1. Masaaki, like Tonelli, fails to disclose the mixing of a remaining portion of discharged permeated water from a pre-final reverse osmosis unit with discharged permeated water from a final reverse osmosis unit, where the final reverse osmosis unit operatively receives a selected portion of the permeated water from the pre-final reverse osmosis unit. In Figure 1 of Masaaki, discharged permeated water 6 from a pre-final reverse osmosis unit 4 is not mixed at all with discharged permeated water 9 from a final reverse osmosis unit 7. Moreover, in Figure 2 of Masaaki, the final reverse osmosis unit 7 receives *un*permeated water 5

from a pre-final reverse osmosis unit 4. Thus, Masaaki fails to disclose the limitations of claim 1 not disclosed by Tonelli. Accordingly, withdrawal of the rejection of claim 2 is respectfully requested.

The Examiner rejected claims 3 and 6-10 under 35 U.S.C. § 103(a) as being unpatentable over Tonelli in view of Bray (U.S. Patent No. 4,046,685). To the extent that the rejection still applies, the rejection is respectfully traversed.

Claims 3 and 6-10 directly or indirectly depend from claim 1, and as mentioned above, Tonelli fails to disclose each and every limitation of claim 1. Bray, like Tonelli, fails to disclose the mixing of a remaining portion of discharged permeated water from a pre-final reverse osmosis unit with discharged permeated water from a final reverse osmosis unit, where the final reverse osmosis unit operatively receives a selected portion of the permeated water from the pre-final reverse osmosis unit. Instead, Bray discloses a single reverse osmosis apparatus, which houses a plurality of semipermeable membranes, that is capable of producing multiple grades of purified water. Bray, Abstract; col. 1, lines 13-16. Bray fails to disclose the use of a plurality of reverse osmosis module membranes altogether, and thus necessarily cannot disclose the mixing of permeated water from a pre-final reverse osmosis membrane module with permeated water from a final reverse osmosis membrane. Thus, Bray fails to disclose the limitations of claim 1 not disclosed by Tonelli. Accordingly, withdrawal of the rejections of claim 3 and 6-10 is respectfully requested.

The Examiner rejected claims 11-16 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Tonelli in view of European Patent No. 1 136 116 A1. To the extent that the rejection still applies, the rejection is respectfully traversed.

Claims 11-16 and 20 directly or indirectly depend from claim 1, and as mentioned

above, Tonelli fails to disclose each and every limitation of claim 1. European Patent No. 1 136 116 A1, like Tonelli, fails to disclose the mixing of a remaining portion of discharged permeated water from a pre-final reverse osmosis unit with discharged permeated water from a final reverse osmosis unit, where the final reverse osmosis unit operatively receives a selected portion of the permeated water from the pre-final reverse osmosis unit. Instead, European Patent No. 1 136 116 A1 entirely discloses types of membranes to be used in a reverse osmosis unit. European Patent No. 1 136 116 A1, page 2, lines 22-26. Thus, European Patent No. 1 136 116 A1 fails to disclose the limitations of claim 1 not disclosed by Tonelli. Accordingly, withdrawal of the rejections of claim 11-16 and 20 is respectfully requested.

The Examiner rejected claim 17-19 under 35 U.S.C. § 103(a) as being unpatentable over Tonelli in view of Bray as applied to claim 3, and further in view of European Patent No. 1 136 116 A1. To the extent that the rejection still applies, the rejection is respectfully traversed.

Claims 17-19 directly or indirectly depend from claim 1, and as mentioned above, Tonelli fails to disclose each and every limitation of claim 1. As mentioned above, both Bray and European Patent No. 1 136 116 A1 fail to disclose the limitations of claim 1 of the present application that are not disclosed by Tonelli. Accordingly, withdrawal of the rejections of claims 17-19 is respectfully requested.

VI. Conclusion

The claims have been shown to be allowable over the prior art. Applicant believes that this paper is responsive to each and every ground of rejection cited by the Examiner in the Action dated July 18, 2002, and respectfully request favorable action in the form of a Notice of Allowance.

Please apply any charges not covered, or any credits, to Deposit Account 50-0591

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Respectfully submitted,

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APPENDIX A – MARKED-UP VERSION OF THE AMENDED CLAIMS

3. The water treatment apparatus according to claim 1,
wherein a ratio (A : B) of an ion concentration (A) of the permeated water supplied to the final-stage module and an ion concentration (B) of the permeated water that is not supplied to the final-stage module is in a range of [1 : 2]2 : 1 to [1 : 10]10 : 1.